SOUND AND CITY

SHANE BARRISCALE
0540641
“Thank you to all my lecturers for their help and guidance throughout the year. And thank you to my family, partner and friends who gave me such great emotional support during such a trying academic term. But especially, thank you to my wonderful, and long suffering mother, who gave me the final push necessary to get my project, and my ambition back on track.”
### CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Thesis Abstract</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>Introduction</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Early Beginnings of Grids and Axes</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Moving Things Along onto Patterns and Sound</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>Exploratory Primer Studies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Shannon Estuary</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>- Hamburg/Hafencity Art and City Competition</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>- University of Limerick Campus</td>
<td>13</td>
</tr>
<tr>
<td>5</td>
<td>Earthbound Precedent Study</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>- IIT Campus</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Readings and Research</td>
<td>19</td>
</tr>
<tr>
<td>7</td>
<td>Site and Brief</td>
<td>27</td>
</tr>
<tr>
<td>8</td>
<td>Design Development- Mid Term Review</td>
<td>31</td>
</tr>
<tr>
<td>9</td>
<td>Design Development- Final Review</td>
<td>35</td>
</tr>
<tr>
<td>10</td>
<td>Final Design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Site Plan</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>- Plans and Perspectives</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>- Long and Cross Sections</td>
<td>55</td>
</tr>
<tr>
<td>11</td>
<td>Final Presentation Layout</td>
<td>61</td>
</tr>
<tr>
<td>12</td>
<td>Project Model Images</td>
<td>63</td>
</tr>
<tr>
<td>13</td>
<td>Bibliography</td>
<td>66</td>
</tr>
</tbody>
</table>
This year began with a series of primer projects aimed at generating designs that were based on my individual interests. In the early weeks these interests moved from 'heaviness and lightness', grids, patterns, composition and arrived at explorations of sound and music based on physical properties such as acoustics and noise, social properties of community, outreach and gathering, and conceptual studies of plans, sections and perspectives based on a language of sound and music mechanics. My scheme is tackling a noisy site, disjointed by infrastructure, in an effort to create a place for the surrounding communities to gather in activities such as rehearsing and performing music, while providing a vital connection point between these communities and a link with the city.

-SHANE BARRISCALE
SOUND AND CITY

INTRODUCTION

Sound and city. Sound and space. The potential of sound in our interaction with architecture and the city is sometimes not so obvious to me. It seems that the first of our senses to engage with our surroundings is sight. We recognise materials, and subsequently get an idea of the tactility as our eye takes in the surfaces and materials. But the sound of space is very rarely acknowledged as a dominant sense it seems. A few exceptions that come to mind are the still quiet of a library or the voluminous echo of a vaulted church. This begs the question, if the shelves, books and chairs of the library were put in a quiet field in the country, wouldn’t the sound requirements of the library remain the same? And if the Church didn’t expect monumental buildings as a sign of power, would the resonating spaces inside them ever have existed?

The sound qualities of these spaces seem to be happy accidents due to other factors. But what if sound was used as a means of shaping a space, or used as the main factor for siting a project? What if a building could behave the same way as a musical instrument, or a musical score, defined by the sum total of its collective sounds? Or what if a building broke down into sound spaces, like a piano that has a range of sounds available but which can be played all at once or individually, depending on the occasion? Or what if, to use the image of a person standing in a busy street, wearing headphones, a building was like a moment of controlled sound in an otherwise uncontrolled sounded space? This is my interest, and this is what I am exploring through my project.
It is interesting now looking back that all of these thoughts about sound began with an interest in grid patterns, that began in the early days of my work on the first primer study this year (See P.11 for more on the Shannon Primer). My personal investigations on the potentials of grid patterns led me mostly through images that were represented in plan, or plan oblique, which were mostly consisted of cities at a macro scale (Fig.1.1). This quickly became tedious due to the two dimensionality that these grids offered and because of a stagnancy of inspiration about the subject. This is why I began looking instead at patterns. The difference between grid and pattern that I immediately noted was that grids dealt in line and intersections and patterns dealt in shape, composition and often fluid in-between spaces, as seen in the example shown in Fig.2.2. Patterns are formed more organically than grids, which often tend to create a tabula rasa effect to uniformly set out an expansive area. Patterns are more insidious, and in my opinion could potentially fit in with existing fabrics more easily by picking up on existing grain and texture and incorporating it into a new layout. The potential of exploring the in-between spaces created by the shapes was intriguing to me at the time. There is also a potential for hierarchy in patterns due to the compositional nature that is used to create them.

At this stage, this enhanced appreciation of composition began bringing up thoughts about music, and subsequently sound. Music is also compositional in its design, the difference being that it arranges itself vertically, like a section, while patterns act more like plans. This prompted an investigation of translating a compositional plan into a section using mechanical concepts seen in music and sound. These included register, or pitch (meaning the positioning of the notes on the stave), amplitude (or loudness) and tempo, or rhythm (meaning the speed or pacing within a song) I created my own compositional patterns using a figure ground technique in plan. Each plan in turn generates a number of different sections and perspectives depending on the criteria used in extruding vertically and were initially inspired by the

Fig.2.1 shows well know plan of cities based on grid layouts. Fig.2.2 shows a painting by an unknown artist which shows an interesting hierarchy of shape in plan. This inspired my studies on pattern. Fig.2.3 shows a drawing by Yona Friedman depicting cityscape that inspired to layering in section in my conceptual studies.
drawings of Yona Friedman, one of which can be seen in Fig.2.3. Examples of some of my studies can be seen in Fig.2.4 and Fig.2.5. This study began suggesting many interesting spaces through the sections and perspectives, but also revealed a need to apply extra layers to the investigations. Both a social layer and a physical exploration of real spaces were needed to place my investigations in the real world, and not simply on an infinite Cartesian plane.

Figure 2.4 shows a conceptual study where I created my own compositional plan. Fig.2.5 shows the possible sections and perspectives that could result, inspired by the drawings of Yona Friedman.
To further my investigations, I concerned myself with exploring a number of different aspects, to constantly changing degrees of importance; 1) The investigation of music and sound mechanics in developing a language of form and space, 2) investigations looking at the social aspects of music and sound in the context of Limerick city and 3) explorations on the potential of specific sites in relation to sound in the areas on the periphery of the city centre, at the point when the city limits end and the suburbs begin.

1) The idea of exploring music and sound mechanics arose from my long-standing interest in playing piano and singing with choirs. To take an example, choral music and architectural drawings behave in a similar way. They are both set out with horizontal and vertical components that come together ultimately to create a uniform thing. In architecture, the plans and sections come together to make spaces. In choral music, the sequencing of notes across the piece comes together with the massing and layering of the parts in the vertical to create a piece which flows because the harmony of all the elements comes together.

Rhythm and pulse play an important part in music. Everything from the speed of a piece of music in its entirety to the coupling of individual notes affects the texture of a piece and makes it unique. Taking this stance in terms of architecture is fascinating, as suddenly space can be measured not only in space, but also in time. This is interesting when you consider how many different paces that we use as we interact with architecture from day to day; walking, jogging, cycling, driving etc. Transport reduces distances into times, so how we engage with buildings by vehicle could be considered.

Pitch is another sound principle that could have a direct impact on architecture. In terms of the voices used in choral music, they are laid out from the heaviest, lowest frequencies on the bottom (basses) to the lightest, highest frequencies on top (sopranos). These can also be seen clearly looking at wavelength diagrams. In my conceptual investigations, seen in model in Fig.3.1-Fig.3.4, I used this principle in the massing of the vertical axis of my compositions. The heaviest volumes occupy the lowest level and the lighter smaller volumes occupy the top.

Fig.3.1 and Fig.3.2 show models of the spatial conceptual studies described above. These two represent the shapes as more solid elements that create interstitial space around them.
There is an instant practical way this could be applied in a building. The higher up a building you go, the more private and secluded the spaces could become, as you move further and further from the street level entrance.

2) I have also explored the social nature of music and sound within Limerick city, in an effort to develop a potential brief. I looked first at the areas used for performing and rehearsing music, within the fabric of a city to add a real, existing element to my investigations that had thus far been absent in my conceptual, formal studies up to this point. This brought up ideas about the social structure within a city, as well as considerations about acoustic conditions existing in some of the interstitial spaces that exist around the city. The idea of music, a potential device for social outreach but also social involvement, is a topic which I have chosen to look at as a brief for my project, which I will discuss in more detail later on in this text.

3) I began looking at the area on the periphery of the city centre due to its interesting topography. For all intensive purposes, the cluster of estates surrounding the city centre begins to look like a suburban typology. The difference is that these estates exist in the shadow of large infrastructure, such as industrial estates, motorways, main roads and raised railway junctions. I took this opportunity to explore the spaces created in and around theses spaces for their potential sound qualities in an effort to see the quality of spaces that exist in these areas. What I found was that a number of spaces are left unbuilt in the wake of these infrastructures, notably beside railways, flyovers and industrial units. I think there is a potential to reclaim some of these territories for the communities that surround them.
This was our first project and served as an initial catalyst for generating my ideas about a possible thesis development. The brief for this site was to create a cold storage facility for the storage of pharmaceuticals.

Because the site in Shannon was initially problematic due to the very specific geometry of the lagoon (see Fig. 4.2), in an effort to come to terms with the scale of what I was doing, I overlaid the part of the site I was interested in with a grid-structured platform to help me orient my buildings. Through conversations with my tutors, it emerged that this has been a recurring theme in my work so far. This prompted the interest in initially studying grids and systems that went on to inform my later thesis research. The outcome of this primer became an extrusion of the grid structure that it sat upon. The platform itself thus became an inhabited thickness or layer for the programme, instead of just a surface that the programme rested on. The curve of the sea wall showed what happens to a grid if a curve is imposed upon it.

Even at this early stage, I was questioning the limitations of a straight grid. The potential of layering a grid also arise, and the potential that layering can have in the emergence of the building below, within and on top of these layers. This layering idea later informed my investigations on pattern, music and sound, notably the idea of extruding vertically and layering in section.

Figure 4.1 shows three working plans of the Shannon Primer and a section through the end result showing the structure of the platform, the industry of the cold storage and the recreation of the people along the facade.
HAMBURG PRIMER

The project in Hamburg was part of an ideas competition in Hafen-City entitled Art and City, which we, the University of Limerick, ultimately won.

This was an interesting follow up to the first primer. It concerned itself with a part of the city that was very heavily master planned. The area I chose to work on consisted of residential areas laid out in blocks. I began to explore different aspects of interacting with an existing city fabric, such as axes, levels, occupying a line of a grid and the resultant space that remains between these lines. My project ultimately became about creating connections along these axes, and also about occupying a thickness between the level of the water and the existing ground. I also explored the idea of occupying the thickness of the platform in my proposal with raised and sunken pools. I paid particular attention to the massing and composition of these pools in plan, and where the connections between the new platform and the existing landscape occurred (Fig. 4.2 and Fig. 4.3).

This primer exposed me to a city scale site and how to design within a system full of existing grains. This was an interesting expansion from the Shannon primer, where the site was separate from any larger city-scale systems. It also began an interest in the nature of infrastructure in the context of residential areas, and prompted me to think about the areas in Limerick that are left broken up by the various infrastructural elements that pass through them, or run alongside them.

Fig.4.2 shows the plan design of my intervention in residential part of HafenCity. Fig.4.3 shows the design idea for the raised and sunken pools that react tidally.
The final primer brought me back to a building scale once more as we were tasked with designing an intervention on the campus of the University of Limerick.

The location I picked for my project reminded me of some of the aspects that had arisen in Hamburg, namely those of axes, connections, public space and interacting with an existing system. In this case, the existing system was a gridded structural system offered by the college building itself. My intervention on the site explored the potential of expanding a two dimensional grid system vertically and using the lines provided to occupy a building within, the plan of which is seen in Fig.4.4. The structure also provided shelter and was formed by following the lines offered by the movement of people through the plaza. The engagement with an existing structure at this scale was challenging as each component piece of the structure was at such a small scale.

The large-scale studies that preceded this primer allowed a certain amount of freedom when it came to laying out a composition in plan. It was following this review that the elements of my thesis shifted from an interest in grids, because the potential of exploring the vertical nature of systems offered an appealing side step into the later discussions that developed on pattern, and subsequently music and sound.

**Figure 4.4**

Fig.4.4 shows the plan for my intervention in the University of Limerick Primer. The lines of the intervention are taken from the lines offered by the structure as well as the lines made by people moving through the courtyard.
Figs. 4.5 show process models of the Shannon Primer, exploring site and form. Figs. 4.6 show an interpretive site model of HafenCity and design models of my intervention. Figs. 4.7 show design, site and conceptual models of the University of Limerick Primer.
As part of a separate module called Earthbound, we were asked to choose a precedent project that would help us understand how an existing project functioned in plan and section, which in turn could inform our own projects. My chosen precedent was the IIT Campus in Illinois Chicago, designed by Mies van der Rohe. The reason for choosing this project was because of its educational brief and because it was a collection of buildings on a campus and not just one singular structure. This collective element inspired an interesting breakdown in plan, which initially drew me to the project.

The campus is laid out on a rectilinear grid system, so all of the buildings are orthogonal in shape. However, the way Mies arranged the plan gave careful consideration to the interstitial spaces between each building (see Fig.5.1 and Fig.5.3). His intention was to create a type of free plan. Each in between space connects to the next in a constant flowing movement that guides students easily through the campus.

I studied the campus for activity levels to try and ascertain the potential acoustic properties of some of these spaces. What I found was that the potential ‘loud’ spaces i.e. the spaces with the most activity, exist in a continuous flowing motion from one end of the site to the next. The ‘quiet’ spaces exist separately to each other, creating zones of quiet dotted around the site.

One particular ‘quiet’ space is the area between the commons building, the chapel and an area of student accommodation. This was achieved by having the main entry points of these buildings facing away from the space, thus reducing activity and creating a sense of calm. The entry to the student accommodation was set back from the façade so that a micro community develops at this point, while still conserving the quiet nature of the space as a whole.

The campus doesn’t only feature composition in plan, but it also features compositional facades. On first glance they may not seem very exciting, with their typically rectilinear layout. However, I analysed them
as a series of rhythm studies to see what types of layering, frequencies and repetitions occurred. The results begin to suggest a further elaboration on loud and quiet that the plan was beginning to suggest. To me, some facades expressed themselves in a lively ‘Vivace’ manner, such as Perlstein Hall. Others had more of a softer ‘Allegretto’ or ‘Andante’ rhythm, such as Crown Hall (Fig. 5.2) and Galvin Library. And some had a very slow ‘Lento’ rhythmic breakdown, such as Wishnich Hall. This is all based purely on my own speculative analysis. All these facades, when put together along the free moving plan, cause an ebb and flow to the spaces, other than those expressed in plan. This coupled with the subtle level changes between two and three storeys result in a dynamic journey through the campus that belies the seemingly axial grid that the buildings are places upon. An example of the space between three different building types can be seen in Fig. 5.4.

Figure 5.2 shows an attempt at analysing the composition of the facade of Crown Hall and my own personal translation of it to a rhythm on a musical stave.

Figure 5.3 shows the loud public spaces in red and the quiet public spaces in blue. This shows that the loud are connected but the quiet are spaced out.
This section-perspective shows an area in IIT campus where three buildings (laboratory on the left, dormitory in the middle and chapel on the right) are arranged to create a quiet public space in between. This is achieved by facing the lab’s entrance away from the space, recessing the entry of the dorm to take people under that building and facing the chapel alongside it, being that it is a quiet area anyway.
While studying patterns in plan and their possible extrusion in section, I came across the book ‘Compositions in Architecture’. In this book Hanlon talks about the potentials of ‘Vertical Layering’ and its ability to “relate a building to both the ground and the sky”\(^1\). One of the most recognisable examples he offers of this vertical layering is Corbusier’s Villa Savoie (Fig.6.1).

“The spike like columns not only support the building, they appear to embed it into the earth, so compositionally this establishes the relation of the house to the ground. The main level is a modernist Piano Nobile and represents an ideal life governed by reason. The structures on the roof, voluptuously curved and painted in pastels, appear in silhouette against the changing colours and cloud forms of the sky\(^2\).”

This vertical layering of programme and form is something I am exploring for the creation of a music space in Limerick, because of my previous studies in section and because the site I chose in Limerick has many datum levels, namely the level of the road, the level of the raised train tracks, the surrounding houses and the slope of the site itself.

What Hanlon does not suggest however is the interaction the different levels have with each other. It seems as though they are first read separately, as layers in a cake, ultimately coming together to make a whole seemingly independent of each other. I think more of a systematic approach could be taken where the section is treated like the plan, and is designed as a whole element and not just as a stacking of programme.

Another interesting aspect that arises from the example of the Villa Savoie is that the vertical layering also takes into account the car on the ground floor and the person on the upper floors. The potential of my chosen site is that because of all its datum levels, it could have many layers of activity ranging from cars, people and trains. There is the potential for it to become a community interchange.

I began re-reading ‘Delirious New York’ around the time I was still exploring grids. However, what ultimately stuck with me in this book is what Koolhaas describes as ‘Vertical Schism’ that occurs within each occupiable block in his

---

1. Don Hanlon, *Compositions in Architecture* (New Jersey: John Wiley and Sons, 2009), 91
discussions of skyscrapers in New York. Because the skyscrapers consist of a vertical stack of floor plates, the potential now exists for each floor plate to accommodate simultaneous functions within a single building. The term Vertical Schism is used to describe this process. The blocks become a type of park, the reality of a single building with the complex idea of a city within a city. These large singular buildings can have a tendency to be read as monuments, which contradicts the divisibility within them. Rather than being a bad thing, Koolhaas cites that this can open up vast new possibilities of spatial complexity. He describes how the interior can increase cubically, while the exterior as a surface can only increase by square. If you were to take away the facades from these skyscrapers exhibiting Vertical Schism, maybe these cubic expansions could be seen as very graphic and exciting, like the paintings of Yona Friedman.

This is what I began seeing in my own conceptual investigations, the section and the plan creating an unexpected series of spaces in between them. What this text does raise is the potential that the elevation has to contain such spaces, and whether or not the inner workings remain a mystery, or if they begin to show on the façade. Steven Holl’s MIT campus building is an example of showing the inner workings of a building on the outer skin, however briefly, as the communal spaces inside (Fig.6.2) are revealed by small distortions on the skin of the façade (Fig.6.3).

In his book ‘Thinking Architecture’ Zumthor makes an interesting very quote regarding the way a building is designed:

“Architecture is always concrete matter. Architecture is not abstract, but concrete. A plan, a project drawn on paper is not architecture but merely a more or less inadequate representation of architecture, comparable to sheet music (Fig.6.4). Music needs to be performed. Architecture needs to be executed. Then its body can come into being.”

The analogy here is that architectural drawing can be considered the same way as sheet music is in creating music. The potential is there, I think, to almost compose a building, so that it too can be performed i.e. built, used and inhabited. Despite its concrete nature, there are a lot of organic things at work.

---

4 Koolhaas, Delirious New York, 88-97
5 Koolhaas, Delirious New York, 100
6 Peter Zumthor, Thinking Architecture (Basel: Birkhauser, 2006), 58

---

Fig.6.2 shows an internal space in Steven Holl’s Simmons Hall and Fig.6.3 shows how it revealed on the facade.
in a building, including sound, light, movement, compression and release etc. I agree with Zumthor’s point that a building ultimately needs to be built and used, but the way it comes into being is in the mind of the architect, and at this stage of imagining spaces, the potential is there to try different ways of looking at spaces, such as through music and sound in my case.

Harvey describes this imaginary process of designing buildings very well in his book *Spaces of Hope*. The first instance is where he describes architecture as a means of physically creating new spaces, but he highlights the fact that they must first image these spaces in a very complex way, relating to a wide variety of elements in a ‘spatiotemporal way’ ranging from social concerns of bettering peoples daily life, as well as spatial concerns of context, material and environmental issues. Ultimately, we are not just creating empty spaces, we are designing spaces for people to use. This is why I added a more social exploration to my investigations, to add a temporal layer to my design instead of just focussing on spatial manipulations, and this led me to developing my brief about music.

In the opening chapter of ‘Translating Music into Architecture’, Martin describes architecture as design in space and music is described as design in time. She then goes on to describe several projects that tried to design using musical principles, in various degrees of abstract, physical and observational studies. In the ‘Vitruvius Program’ the physical aspects of sound waves, noise and harmonies were explored in model and drawing in a very physical way.

In the ‘Y condition’, Martin starts by quoting Louis Khan as saying:

“Architecture starts with the immeasurable, proceeds through the measurable and returns to the immeasurable.”

This to me signifies what Zumthor was saying above. The inception of buildings is in the initial drawings, where concept is key and physical properties are sidelined occasionally. They then become ‘concrete’ as the working drawings are prepared. But ultimately, the building should return to being an ambassador of its concept on completion, once again being primarily read at an immeasurable level.

---

7 David Harvey, *Spaces Of Hope* (Edinburgh: Edinburgh University Press, 2000), 200
9 Martin, *Architecture as a Translation of Music*, 16
In the same chapter, Martin describes site as having certain musical over-
laps, including ‘simplicity, repetition, illusion/perception, events, complexity and
sudden density changes, harmony and counterpoint’.  

In ‘Freeway as Instrument’, the temporal nature of driving on a freeway is
described by Zeog Designs. This once again shows up the potential of devel-
oping a space through time and not just distance depending on the pace of our
interactions with it.

Steven Holl describes his ‘Stretto House’ as a more physical interpretation of
architecture and music. He took a symphony by Bartok and created a building
using a similar language as the structure of the piece itself. He distinguished
the different textures of instruments used, using both heavy structures to sym-
bolise percussion and light structures to symbolise strings. The plan is in four
orthogonal blocks symbolising the four movements, and the section is curvilin-
ear to signify the flow of the music. (See Fig.6.5)

“Floor plans pull the level of one space through to the next. Roof planes pull
space over walls. Arched walls pull light down from a skylight.”

This sort of interpretation is very specific to its muse piece of music. Howev-
er, the language developed and how it is articulated shows the way that music
can potentially shape a space and this something I would like to explore during
the process of designing my building.

To put my early conceptual studies about using a language of sound to cre-
ate spaces in plan and section in a literary context, I began reading Lefebvre’s
‘Rhythmanalysis’. He begins to describe the aspects of music, sound and
rhythm in a very physical way. He starts by looking at juxtaposing opposites
and contrasts in music.

Low and High- In this case, the musical page can be read spatially depend-
ing on the positioning of the notes upon it within the structure of the piece. As
I said above in reference to Hanlon’s ‘Vertical Layering’, a similar language to
this could be used to create a section that functions with all its component parts
adding to the whole. A sense of spatial harmony could occur, similar to that
which occurs when all the parts on a musical stave come together.

Vivace Adagio- Here Lefebvre refers to the speed, or pulse of a piece, but
it is of course relative to those playing it. The building could react differently to

10 Martin, Architecture as a Translation of Music, 17
11 Martin, Architecture as a Translation of Music, 56

![Figure 6.5](image-url)  
Fig.6.5 shows Steven Holl’s Stretto House which was designed using the muse
piece by Bartok.
Different paces of use depending on those that inhabit it at the time, or even the speed at which people approach the building at.

Verticality-Horizontality- Lefebvre describes the way the music is spatially arranged on a stave in direct response to the low and high described above. He writes that music ‘presupposes a unity of time and space. An alliance.’ This sentence in itself can be applied to architecture in two ways; in a temporal manner to do with use and interaction based on time and in a very physical way based on how we position ourselves within a building. Ultimately, my project will try and achieve a juxtaposition of space and time. Even a consideration about acoustics begins to think about both, because sound affects our experience of physical spaces, but its rate of movement is measured in time.

Another interesting point that Lefebvre states is that music operates on three planes; range of notes, frequency (Fig. 6.6) and intensity, or volume (Fig. 6.7). To me, in relation to architecture, the range of notes and the intensity could apply to the composition of the plan, and the frequency to the section, or similarly, the frequency and intensity could apply to the plan and the range of notes to the section. This helps me understand my initial efforts at composing my own patterns in a very logical way. The massing and distribution could be seen as a manipulation of frequency (heavy and light?) and intensity (big and small?) and the range of notes determining the position on the stave (frame).

“An open space is like a bucket with no bottom, impossible to fill no matter how much sound you pour in, whereas an enclosed space is like a leaky bucket, filling easily and emptying slowly…and a cathedral, whose reverberation time can be as long as 10 seconds, is like a mammoth bucket with a miniscule hole.”

In the book ‘Spaces Speak, are you Listening’, Blesser and Salter describe musical spaces, such as concert halls, as being acoustically defined by the reverberation of sound. The above quote signifies the difference between an outside and an inside space in terms of how we hear a performance in both settings. Sound waves continuously expand in outside spaces so that once it passes our ears, it keeps going and we don’t hear it again. Inside spaces offer the sound

---

12 Henri Lefebvre, Rhythmanalysis, Space Time and Everyday Life (New York: Continuum, 2004), 58
13 Lefebvre, Rhythmanalysis, 60
14 Lefebvre, Rhythmanalysis, 60

Fig. 6.6 shows a frequency diagram depicting the difference between high and low pitch. Fig. 6.7 shows a graphic displaying amplitude, or loudness, in a distinctly spatial way.
waves the chance to reverberate off all the surfaces they come into contact with (Fig.6.8), depending on their absorptive or reflective qualities, until ‘gradual decay’ causes the sound to eventually dissipate. The potential I gained from this text was in regards to larger performance spaces, and the fact that within a singular space that you might get variances of sound due to the areas that receive less or more reverberation. An example that is offered in the text is that of a deep overhanging balcony. The space underneath, although part of the main space, receives less reverberated sound waves and thus the sound quality diminishes sooner than upon the balcony. This could be used as a programmic device to do with shaping different types of spaces with tectonic elements other than walls and closed volumes. Blesser and Salter suggest that:

“Just as the designs of modern spaces are constrained by the need to host the historical musical repertoire, which is taken as an inflexible instrument, so composers write their music for immutable spaces that already exist.”

This statement is borne out of the high cultural capital typically associated with classical music and performance halls that accommodate it. Because I am creating a building in Limerick that enhances disadvantaged communities, there is an opportunity to break this connection, or at least bend it in favour of acceptance of all types of people and musical expression. Following on from the potential of creating varying sound spaces that I discussed above, the creation of many different areas that people can perform in within a building, ranging from the casual to the more organised, is much more desirable to me.

“Can architecture be heard? People would probably say as architecture does not produce sound, it cannot be heard. But neither does it radiate light and it can be seen...we hear the sounds it reflects and they give us an impression of form and material.”

Rasmussen sets out in his chapter ‘Hearing Architecture’ that because we appreciate the building as a totality that, more often than not, we will not pick up on all the individual elements that make up a space, including its sound. His example of a room being perceived as ‘cold’ rings especially true with me. He states that it is a combination of hard light, hard surfaces and a muted colour

---

16 Blesser and Salter, Spaces Speak, Are you Listening, 128
17 Stein Eilen Rasmussen, Experiencing Architecture (Massachusetts: MIT Press, 1964), 224
18 Rasmussen, Experiencing Architecture, 225
that causes this sense of cold rather than the temperature. He also says that a change of materials is all that is required to completely change the quality of that space (see Fig.6.9 and Fig.6.10). This is very important in my scheme. To start with an enhanced level of sound consideration, the choice of materials will be very important in shaping and creating both loud spaces (hard) and quieter spaces (soft) and mixed spaces (overlap, bevel, layer).

I looked at two books in relation to acoustics in architecture. They were mostly scientific in nature, but offered a number of interesting points on the methodology of design sound spaces in architecture.

In 'Collected Papers on Acoustics', Sabine offers some interesting opinions on the nature of Architectural acoustics and how our considerations fall into two categories:

“One, to determine quantitatively the physical conditions on which loudness, reverberation, resonance and the allied phenomenon occur, the other to determine the intensity which each of these should have… One is a purely physical investigation, and its conclusions should be based and should be discussed only on scientific grounds; the other is a matter of judgement and taste.”

I fall more into the latter category of utilising my own judgements in creating sound spaces. As mentioned in Harvey above, we as architects first imagine what spaces might be like before they have a chance to be built. So I am trying to design an amazing building based on sound, but mostly to my own judgements of what a space should sound like, which are informed also by the scientific specifics.

One such specific appears in Maekawa and Lord’s text ‘Environmental and Architectural Acoustics’. Here the authors describe the ideal situation for a performance space as one that has a dispersed reverberation pattern that allows sound to reach all areas of a space rather than one which results in pockets of reverberated sound hitting some parts and not others, resulting in differences of how we experience the sound of a singular source. However, as I mentioned above, there is a potential in this creation of reverberation differ-

---

19 Wallace Clemens Sabine, Collected Papers on Acoustics (California: Peninsula Publishing, 1922) 69
ences if a singular space with different properties is desired. This is something that I hope will become evident in my own scheme.

“The influence of music in our life is more pervasive than we might realize. This influence can harm or heal us. It can change our mood from boredom to exuberance. Music can bring tears to our eyes in graceful reverence. It can also plunge our spirits as with a Dirge. As a consequence music can enhance our creative potential or deter it, depending upon its harmonics and frequency.”

In his article ‘Creative Harmonics, Reid describes the positive mental affects that harmonic music has on peoples mind. He details two examples of these effects. One, an experiment undertaken by college students, who after 10 minutes of listening to Mozart, scored 8 to 9 points higher in sample exam than those listening to relaxation tapes or silence. The theory being that harmonic music resonates with our brain’s natural frequencies and enhances neural activity. Two, he describes the findings of Alfred Tomatis on Gregorian chant, something engaged in by many choirs, as being ‘Brain Food’ operating at just the right high frequency to enhance brain activity. Even personally, listening to classical music, or choral music both relaxes and focuses me. The many successful efforts in using music as a means of outreach also show that it has a significant effect on people’s behaviour and mindset. I will discuss these programs briefly in the next chapter.

In the context of my investigations, this information, coupled with a move for social improvement seems to tread comfortably hand in hand with the beginning of my brief. It also reinforces the relation between music and education, and also music and wellbeing. To me, Read’s most resounding point is that:

“Harmony is the quality of music as a frequency that renders its ability to touch and move the soul. Harmony is understood to be “a pleasing agreement of parts,” according to Webster’s dictionary. The difference between music and noise is defined by the attribute of harmony.”

---

22 Read, “Creative Harmonies,” Enchanted Mind

Fig.6.11 shows one of Limericks many youth choirs and Fig.6.12 shows a group of school children that took part in the ‘Sing Out With Strings’ project.
The site I have chosen to situate my project in is Limerick City but more specifically, its peripheral boroughs. Limerick features several areas of disadvantaged communities that are situated on the peripheries of the city. Three of these have already been targeted as regeneration areas, namely St Mary’s Park, Southill and Moyross. The main problem associated with many of these areas is the disconnect from the city often caused by the layout of infrastructure between them and the city centre. They have become isolated communities, with a lack of social outlet or amenity. This in turn has caused many social issues, and this lack of amenities and cultural outlets has caused the situation to fester resulting in a reputation for antisocial behaviour being attached to these areas. I am exploring how music and education can affect such areas to try and draw these communities back from the periphery and unite the city through the medium of a social and cultural aspect.

The figure ground in fig.7.5 on the page 29 shows the dispersion of music activities across Limerick city and suburbs. What becomes clear is that the city has an education-based periphery and a performance-based core. With a little nuance and development, the areas on the peripheries could develop further than just education. Following the environmental sound studies seen in fig.7.1 and fig 7.7, I had identified three possible sites that could become areas for developing a scheme that could enhance the social aspects of these communities through music (fig.7.2). I have since narrowed it down to just site 1 (fig. 7.4) and I am creating a link from the periphery to the city via the train tracks, as they feature so prominently on the site, seen in fig.7.3. The communities in turn can provide the new talent that will enhance all of the future performances that happen in these areas.

The types of spaces I am creating are for rehearsal and performance of music. My mapping of the city shows that there is large number of schools in these peripheral areas. The teaching of music in these institutions is already possible, but practicing, rehearsing and having a dedicated space for playing music with others socially is lacking. What is also lacking in these areas is a place to execute the end product of these rehearsals, the performance/concert/show. At present, projects such as the ‘Sing out with...
Strings’ community music project, run by the Irish Chamber Orchestra, rehearse in the schools and subsequently perform in the local churches or community halls. The ‘publicness’ of these venues is the only requisite for the project at present; the quality of the spaces is not always at the forefront due to funding or circumstance. Because the performance aspect of music is as important as the learning and rehearsal, such a space could be developed in these areas to allow this cyclical process of teaching, rehearsing and performing to occur and have the potential to widen these communities social standing in the eyes of the city as a whole, while offering a link that connects them to help overcome the fragmentation that has occurred because of the infrastructural elements on the site (the road, the rail and the industrial estate).

These types of spaces require a careful spatial arrangement to facilitate all the necessary parties, as well as a carefully designed and crafted acoustic. In my concept, based on my sound analysis of these peripheral spaces, they could behave in very different ways depending on the activity being performed within. The rehearsal space could be about absorption, taking in sound-creating people from the communities and focusing the sound inwards on itself, allowing this sound to move around inside the spaces like the inside of an instrument. The larger performance space could alternatively be about explosion, and become a celebration of sound.

Limerick would benefit from these spaces as they could offer a cultural landscape, similar to that aspired to by EV+A in dispersing art around the city (lower half of Fig.7.3). The cyclical nature of rehearsal and performance means that this could generate a timeline of events right throughout the year. It would give students from disadvantaged areas vigour about performing, and it would give the public a reason to include and participate in music out in these communities also. Because of Limerick’s size as a small city, it has the potential to become this wonderful melting pot of culture.

Fig.7.2 shows the area of the city that I have chosen as the centre of my design, marked by the red number 1. Fig.7.3 shows an early idea about creating a route from the centre of the city marked with a number of small interventions before arriving at the site. Fig.7.4 shows an aerial view of the site as it exists now, showing the two railway tracks and main road that flank it.
Fig. 7.5 shows a mapping of musical activity across Limerick city and suburbs.
Fig. 7.6 shows the city’s peripheral area that is subject to degeneration and marks out the empty unused spaces that exist between the infrastructure.

Fig. 7.7 shows a breakdown of the sound studies.
The first draft of my design features a series of perspectives along the connecting route to the city showing smaller informal performance and sound spaces (fig. 8.1 - fig. 8.6). This will ultimately become the starting point for a cultural festival, as mentioned earlier, like EV+A has done for the arts. This route ultimately culminates in my chosen site, where my intervention provides an informal setting for practicing and performing music. My intention is that it would act as a catalyst for the area providing a community cultural outlet through the medium of music.

These drawings show my first attempt at organising the site (fig. 8.7) and utilizing the different datum levels as a way of moving people through the building (fig. 8.8 and fig. 8.9). The smaller practice spaces here are situated along the main train tracks, bevelling in a way to release the sound of people practicing into the central street. The opposite side of the site featured a more formal concert hall space, with a series of technology rooms separating this space almost completely from the central street. There was a choir chamber located on the 3rd floor level, which suspends over the central space. The walls are thicker and harder in this space to allow for an extra reverberation to help sustain choral music during practices.

These early sections and plans informed the direction of my subsequent design development. The breakdown of the site in the next stages maintained the layout of the practice spaces on the main train tracks, the performance spaces on the lesser train tracks, and a connective central street connecting the two.
Fig. 8.7 shows the first design site plan showing the first floor of the building, which is where the pedestrians will mostly enter onto. It shows the layout and orientation of the smaller practice rooms, the two areas of public space, the technology rooms in the centre and the formal performance space and recital room.
Fig. 8.8 shows a long section elevation looking at the breakdown of the smaller practice rooms and it also shows the location of the choir rehearsal room on the 3rd floor, while beginning to hint at materiality and light. Fig. 8.9 shows a short section that cuts the tracks, the path, the smaller practice spaces, the central space and the choir rehearsal room, the technology rooms, the formal performance space, the opposite tracks and a house in the estate beside the site.
Fig. 9.1 shows the track elevation.

Fig. 9.2 shows the front elevation.

Fig. 9.3 shows a view of the central street showing materiality and structure.

Fig. 9.4 shows the corridor and classroom arrangement of the 2nd Floor.

Fig. 9.5 shows the entry from the back.

Fig. 9.6 shows a practice room with a gathering space outside.

**DESIGN DEVELOPMENT: FINAL REVIEW**

By the final review prior to the portfolio assessment, the layout of my scheme had developed as seen in figs. 9.7-9.10.

The lower levels became spaces for performance and the upper levels became spaces for practice. The practice spaces on the upper levels were laid out in varying sizes and forms to try and create different types of sound dynamics within the rooms. The corridors outside contained spaces between the classrooms for people to gather between practices.

This was the first attempt at using the datum levels of the tracks to inform a difference between the materiality of both areas of the building. This begins to show in the sections seen in figs. 9.11-9.13 (overleaf) and the perspectives to the left (figs. 9.1-9.6).
Fig. 9.7 shows ground floor plan at the final review.

Fig. 9.8 shows first floor plan at the final review.

Fig. 9.9 shows second floor plan at the final review.

Fig. 9.10 shows third floor plan at the final review.
Fig. 9.11 shows a long section through the classroom side of the building.

Fig. 9.12 shows a long section through the performance side of the building.
Fig. 9.13 shows a cross section through building, showing both the classrooms and the performance spaces, but also the datum level of the tracks.
The aim of this project this year was to provide a cultural connection from the city to a peripheral community that has subject to social degeneration, and that a link in this cultural route would become an informal centre for the practice and performance of music within the community itself, that would act both as a draw for the people in the city and the community.

The centre is located at one of the noisiest, busiest interchanges in the city, where two train tracks, a busy road and a large industrial estate meet. The aim of the project was to introduce a controlled element within all this, to reclaim a lost piece of land for people to use and to reintroduce the pedestrian to this area of the city as a way of moving.

The route itself, from left to right, starts at Colbert train station, and moves alongside the tracks, meeting a number of small interventions along the way (see fig.8.1-8.4). This ultimately leads you to the site of my building, which acts as a sponge, drawing people from the route and the road into the spaces I have created, which are shown in the following pages. The end point of this route is a sole warehouse building which is to be reclaimed as a space for concerts when a larger venue is required. The church seen in the graveyard is a counterpoint to this space, offering an opportunity for a sacred space for more solemn events. This church can be accessed off the main route.

The building then becomes an intermediary space offering a combination of large and small spaces for practice and performance.
The ground floor plan shows the heavier voluminous spaces that sit below the level of the tracks. Fig.10.4 shows the large performance spaces and the workshop spaces connected by a central street that traverses the site. There is a circular courtyard space at the back that is open air, and due to its sunken position below the tracks would benefit from a type of acoustic oasis from the sounds above.

Fig. 10.2 shows the front elevation with a heavy concrete porch area on the bottom and a slit facade that lets shafts of light into the library, and uses the shelving elements of the library itself to temper sound. Fig. 10.3 shows a performance space with wall niches and balcony area that lets light in.
Fig. 10.4 shows the ground floor plan of my final scheme. It contains performance spaces, workshops and an exterior courtyard. Fig. 10.5 shows a speculative render of the expected sound levels that would be present on this floor during times of heavy use.
The first floor plan (fig.10.7) shows that the rooms on the ground floor are double height spaces and also introduces a balcony element overlooking the performance space. This is accessed from the circulation off the back courtyard and leads to the library area which is located behind the front facade. The library features niches like opera boxes which overlook the main performance space from above during concerts, or act as separate reading spaces at all other times.

Fig. 10.6 shows a perspective of the library and a hint at the openings of the reading spaces/opera boxes. The bookshelves act as a way of tempering the sound of the street from the outside, ultimately using the softness of the books to absorb excess noise.
Fig. 10.7 shows the first floor plan of my final scheme. It contains the double height of the performance spaces and the workshops. It also contains a balcony which looks down on the performance spaces and leads to the library and administration area to the front of the building. Fig. 10.8 shows a speculative render of the expected sound levels that would be present on this floor during times of heavy use.
The second floor plan (fig. 10.11) is the access level from the tracks. The main train tracks spills onto a free space, or ‘breakout’ space that could be used for many types of gatherings. It steps down from the tracks to offer a separation from the main circulation from the city. A perspective of this space can be seen in fig. 10.9. This level also features an outdoor performance plaza that can be accessed from a wide path off the main tracks. A perspective of this can be seen in fig. 10.10.

Fig. 10.6 shows a perspective of the library and a hint at the openings of the reading spaces/opera boxes. The bookshelves act as a way of tempering the sound of the street from the outside, ultimately using the softness of the books to absorb excess noise.
Fig. 10.11 shows the second floor plan of my final scheme. It contains the double height of the balcony and library space, an outdoor performance plaza and a ‘breakout’ space stepped down from the main tracks. Fig. 10.12 shows a speculative render of the expected sound levels that would be present on this floor during times of heavy use. This time it shows a heavy peripheral use.
The third floor plan (fig.10.15) begins the practice rooms of the building. They are developed with an idea of dispelling the traditional corridor-classroom arrangement, instead opting for a more free form, fluid space that would lead to people finding pockets of spaces to suit their own practice needs. At this level the spaces are quite generous, so that larger gatherings of people could be accommodated.

The perspectives in figs.10.13 and 10.14 show that by contrast to the heavier elements on the lower levels, the upper levels have more of an emphasis on baffling sound and creating looser, freer spaces using a steel frame structure and steel louvres to buffer and filter exterior sounds through these spaces.

These types of spaces are informed by the primer study I did on IIT campus. The layout of the campus buildings in plan creates pockets of space that are quiet along a busy, loud route (see fig.5.3). This is the type of condition I was trying to create here, at a smaller, more personal scale.
Fig. 10.15 shows the third floor plan of my final scheme. It contains practice spaces that loosely connect to each other to dispel with the traditional corridor classroom layout. Fig. 10.16 shows a speculative render of the expected sound levels that would be present on this floor during times of heavy use.
The fourth floor plan (fig. 10.18) shows a continuation of the practice spaces from the level below, with the spaces beginning to reduce in size as people get further from the main gathering and circulation spaces.

Fig. 10.17 shows a perspective of this level and how the free movement of spaces might look.
Fig. 10.18 shows the fourth floor plan of my final scheme. It contains practice spaces that loosely connect to each other to dispel with the traditional corridor classroom layout. The spaces are getting smaller and more closed the higher up the building you go. Fig. 10.19 shows a speculative render of the expected sound levels that would be present on this floor during times of heavy use.
The fifth floor plan (fig. 10.21) shows a continuation of the practice spaces from the level below, with the spaces again reducing in size and now becoming more closed off to allow for individuals, or smaller groups to gather and benefit from this being the most private level of the buildings.

Fig. 10.20 shows a perspective of this level and an idea of light and sound wells in the floor. These make this area of the building behave like a sound sponge as all the sounds of people practicing find their way up and down the building.
Fig. 10.21 shows the fifth floor plan of my final scheme. It contains practice spaces that loosely connect to each other to dispel with the traditional corridor classroom layout. The spaces here are the smallest and most closed to allow for individuals to practice. Fig. 10.22 shows a speculative render of the expected sound levels that would be present on this floor during times of heavy use.
The following pages show a series of sections through the building which show many of the aspects I was striving for in my scheme.

Fig.10.25 shows a sectional perspective through one of the main performance spaces. It features prominently the balcony element, which acts a sort of ‘Triforium’ spaces like those seen in cathedrals. The seating on the upper level filters light and sound through this space. A perspective of this can be seen in fig.10.24.

Fig.10.26 (overleaf) shows a long section through the performance spaces, showing the Catalan vault roof construction that sits on heavy concrete walls, the circulation in the back of the site, and the library at the front which overlooks the largest performance space.

Fig.10.27 (overleaf) shows a long section through the workshops, 'breakout' space and upper practice spaces, showing the light structure sitting on the heavy and beginning to show the connections between the practice spaces on the upper levels.

Finally, fig.10.28 (overleaf) shows a cross section through both train tracks that flank the site. This shows the concept of using the heaviness below the tracks to generate the lower spaces, and the lighter, expanding spaces that occur above the datum of the tracks.
Fig 10.25 shows a section perspective view of one of the main performance spaces, the ‘Triforium’ balcony, the workshops and the outdoor performance space. It shows the materiality and structure of these spaces, showing the Catalan vault, concrete walls and limestone retaining wall element.
Fig 10.26 shows a long section through the performance spaces, showing the library to the front, the outdoor performance space above and the outer courtyard at the back. It shows this part of the building sitting heavily below the level of the tracks.
Fig. 10.27 shows a long section through the practice spaces, ‘breakout’ space and workshops. It shows the sponge-like breakdown of the practice spaces and how the loosely defined plan reads in section. It also shows the secondary circulation point to the front of the site.
Fig 10.28 shows a cross section through the site showing the different building language used in each part of the building. It shows how the lower part of the building sits heavily below the datum of the tracks, and it shows the practice spaces rise and expand above the datum.
Sound and city. Sound and space. The perception of sound in our interaction with architecture and the city is something we do not often consider. In many instances, we engage with our surroundings in a way that is not necessarily conscious, and we often take for granted the acoustical qualities of our environment. Yet, sound is an integral part of the way we experience space and can have a profound impact on our perception of the built environment.

The sound qualities of these spaces seem to be happy accidents due to other factors. But what if sound was used as a means of shaping space, or used in the way better to control a space? By incorporating sound into the design of a space, we can create unique acoustic environments that enhance the experience of the user. Sound design can influence the way we perceive space, and it can be a powerful tool in shaping the way we interact with our environment.

In urban design, the integration of sound can play a crucial role in creating a sense of place. By carefully designing the acoustical qualities of a space, we can create environments that are both functional and engaging. Sound can be used to create boundaries, to reinforce spatial relationships, and to guide the movement of people through a space. By understanding the role of sound in the urban environment, we can create more dynamic and engaging spaces that better meet the needs of the people who use them.
Fig. 12.1: 1:1000 Site Model showing industrial infrastructure

Fig. 12.2: 1:1000 Site Model showing route from the city through the site with varying context

Fig. 12.3: Compositional section study models

Fig. 12.4: Concrete 1:20 construction model of main space

Fig. 12.5: Structure model

Fig. 12.6: Spatial study

Fig. 12.7: Facade Study - Le Corbusier Museum

Fig. 12.7: 1:50 Structure-Elevation Model
BIBLIOGRAPHY


